

## **Influence of resonant magnetic perturbations on transient heat load deposition – a short review**

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One important aspect in thermonuclear fusion research is the control of instabilities that occur in the edge of the plasma and lead to an ejection of energy, so called edge localized modes (ELMs). Magnetic perturbation fields which are resonant in the plasma edge are found to modify the plasma and reduce the impact of these instabilities. The transient energy ejection which is triggered by the instabilities causes heat loads on the wall components that may not be tolerable for the next generation of fusion devices. Therefore, it is crucial to understand in detail how resonant magnetic perturbation (RMP) fields affect the heat load deposition.

The upgraded divertor infra-red viewing system and the new tungsten divertor at the Joint European Torus allow for a detailed study of the heat load deposition profiles caused by transient events. Throughout this work, the use of fast divertor infra-red thermography shows that the transient heat load depositions change from a random pattern to a static split structure if RMP fields are applied. Comparisons with a thermoelectric current model demonstrate that the splitting found experimentally during the plasma edge instabilities can be explained by considering additional currents in the very edge of the plasma.

Besides a modified heat load distribution, another temporally varying process is observed that appears to be linked to the static heat load structure and causes a slow propagation of a heat flux pattern long before the major energy is ejected. This process is very slow compared to typical ELM time-scales. It appears that due to the RMPs, the process leading to a temporally varying heat flux pattern decouples from the major energy deposition. This sheds new light on the physics of RMP fields as it shows that processes on different time-scales are involved during the control of the plasma edge instabilities.

\*See the Appendix of F. Romanelli et al., Proceedings of the 25th IAEA Fusion Energy Conference 2014, Saint Petersburg, Russia